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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| EXAMINER |
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MCDONALD, RODNEY GLENN

| ART UNIT | PAPER NUMBER |
|----------|--------------|
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1753

DATE MAILED: 08/21/2003

6

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/069,512

Applicant(s)

YAMASAKI ET AL.

Examiner

Rodney G. McDonald

Art Unit

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2,7.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-5, 7-10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyata et al. (EP 0 762 471) in view of Arami et al. (U.S. Pat. 6,014,943).

Miyata et al. teach a dipole ring magnet in a magnetic field generator for magnetron plasma in an apparatus for plasma sputtering or plasma etching. (See Abstract)

Figure 7A illustrates a dipole ring magnet (Compare to Applicant's magnetic field forming means requiring a dipole ring magnet) as improved

Art Unit: 1753

according to the second aspect of the invention by a plan view and Figure 7B illustrates a vertical axial cross section of the same as cut and viewed along the direction indicated by the arrows VIIB-VIIB in Figure 7A. (Column 7 lines 42-47)

Similarly to the conventional **dipole ring magnet** illustrated in Figures 3A and 3B, **a plural number of anisotropic columnar segment magnets**, i.e. unit magnets, 50(1) to 50(16) are to be held and supported in a nonmagnetic frame 52 symmetrically to the Y-axis in Figure 7A. Different from the conventional embodiment illustrated in Figure 3A, in which 16 unit magnets 40 are in a circular arrangement keeping a uniform distance from the adjacent ones with symmetry relative to the X-axis and Y-axis, **the arrangement of the unit magnets 50(1) to 50(16) in Figure 7A is not symmetrical relative** to the X-axis with omission of the unit magnets 50(10), 50(11), 50(13), 50(15) and 50(16) as is shown by the broken line squares indicating the respective imaginary positions of the omitted magnets. It should be noted that the positions including those of the actual unit magnets and those of the omitted or imaginary unit magnets are arranged each keeping the identical distance from the adjacent ones. (Column 7 lines 48-59; Column 8 lines 1-7)

As a consequence of the above described asymmetrical arrangement of the unit magnets or omission of some of the unit magnets in the region where the magnetic field in the horizontal direction is low, **the magnetic field thus formed inside of the dipole ring magnet has such a gradient as shown in Figure 6A that the magnetic field is low in the negative side of the Y-axis and montotonously increases toward the positive side of the Y-axis.** (Compare to Applicant's dipole ring magnets that

Art Unit: 1753

form a gradient) Although Figures 7A and 7B are given for asymmetric arrangement of 11 unit magnets by omitting five unit magnets from the 16 unit magnets to be uniformly arranged in a circular fashion, the way to have an asymmetric arrangement of the unit magnets is not limited to this embodiment with a possibility of various modifications.

(Column 8 lines 8-22)

Magnets 50(8), 50(9), 50(12), 50(14), 50(1), and 50(2) represent anisotropic magnet segments that help form the magnetic gradient. (See Figure 7A) (Compare to Applicant's requirement for anisotropic magnets forming a magnetic gradient)

Magnet 50(7) of Figure 7A represents one anisotropic magnet with a N pole directed toward a region. (See Figure 7A) (Compare to Applicant's at least one second anisotropic magnet)

Magnet 50(3) of Figure 7A represents one anisotropic magnet with a S pole directed toward a region. (See Figure 7A) (Compare to Applicant's at least one third anisotropic magnet)

In Figure 6A the magnetic field in the region is increased to be greater along the Y axis by the action of magnets 50(7) and 50(3). (See Figures 6A) (Compare to Applicant's requirement for increased magnetic field in a region that is larger than first anisotropic magnets.)

The target substrate is 56 in Figure 7A. (Figure 7A) (**Compare to Applicant's required substrate**)

All the magnets are disposed together in a ring-like shape. The magnet are continuously arranged. The magnets are slightly shifted to one another. The magnets

Art Unit: 1753

have gaps that varying in size depending on the downstream or upstream side of the substrate. (Figure 7A).

The differences between Miyata et al. and the present claims is that the details of the etching apparatus is not discussed.

Arami et al. teach a plasma process device which includes a process vessel **(Compare to Applicant's chamber)** having a plasma generating area therein, a susceptor provided in the process vessel for supporting a substrate having a process surface, and a gas inlet means for introducing a process gas into the plasma generation area. **(Compare to Applicant's process gas supply means)** A dipole ring magnet is arranged around the outer periphery of the process vessel, for generating a magnetic field having a magnetic line of force in the plasma generating area, so that a plasma of the process gas is generated in the plasma generating area. (See Abstract)

At the bottom wall of the process vessel 3, an exhaust duct 12 is partially provided so as to face the opening of the supporting board 5. The exhaust duct 12 can communicate with vacuum means 13 such as a turbo molecular pump. The pressure in the process vessel 3 can be reduced to, e.g., 10 mTorr by the operation of the vacuum means 13 through the evacuation duct 12. (Column 5 lines 45-51) **(Compare to Applicant's wall for containing reduced pressure)**

The vessel comprises an upper electrode 22 and lower electrode/susceptor 6. (Column 5 line 62; Column 6 lines 31-33) **(Compare to Applicant's pair of electrodes)**

Art Unit: 1753

Two high frequency power sources 31, 34 assist in generation of the plasma.

(Column 6 lines 27-39) (***Compare to electric field forming means***)

The motivation for utilizing specific details of an etching apparatus is that it allows for providing elements that assist in plasma etching. (Column 2 lines 13-20)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Miyata et al. by utilizing the details of the etching apparatus as taught by Arami et al. because it allows for providing elements that assist in plasma etching.

Claims 6 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyata et al. in view of Arami et al. as applied to claims 1-5, 7-10 and 12 above, and further in view of Sakai et al. (U.S. Pat. 5,717,294).

The differences not yet discussed is the value of the magnetic field.

Sakai et al. teach in Figure 4 the intensity of a magnetic field with a gradient required for etching. The value of the magnetic field facing the substrate can be 200 Gauss with the value exceeding 200 Gauss in the upstream direction. (See Figure 4)

The motivation for utilizing certain magnetic field values is that it allows for forming a uniform plasma density. (Column 9 lines 2-3)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized a specific magnetic field as taught by Sakai et al. because it allows for forming a uniform plasma density.

Art Unit: 1753

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 703-308-3807. The examiner can normally be reached on M- Th with Every other Friday off..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 703-308-3322. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9310 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



Rodney G. McDonald
Primary Examiner
Art Unit 1753

RM
August 11, 2003